

Patent Application Serial No.: 09/884,284
Attorney Docket No.: 0190160

List of Claims:

Claim 1 (Currently Amended): An intelligent control circuit for processing pixel defects in a sensor, the control circuit comprising:

- a defective pixel detection circuit for detecting whether an underlying pixel is defective;
- a pixel value restoration circuit for replacing ~~the~~ a value of the underlying pixel, if defective, with a restoration value derived from ~~the~~ values of neighboring pixels;

wherein the control circuit operates in real-time; and wherein the defective pixel detection circuit comprises:

- a white pixel detection circuit for detecting stuck high defects;
- a dark pixel detection circuit for detecting stuck low defects; and
- an abnormal sensitivity detection circuit for detecting abnormal sensitivity defects.

Claim 2 (Cancelled)

Claim 3 (Previously Presented): The method of claim 1 wherein the underlying pixel is processed by at least one of the white pixel detection circuit, dark pixel detection circuit, and abnormal sensitivity detection circuit.

Claim 4 (Original): The circuit of claim 3 wherein the white pixel detection circuit, the dark pixel detection circuit, and the abnormal sensitivity detection circuit process the underlying pixel serially.

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Claim 5 (Original): The circuit of claim 3 wherein at least two of the white pixel detection circuit, the dark pixel detection circuit, and the abnormal sensitivity detection circuit process the underlying pixel in parallel.

Claim 6 (Original): The circuit of claim 1 wherein the neighboring pixels comprise:
a first group; and
a second group, each group being processed by the defective pixel detection circuit separately.

Claim 7 (Original): The circuit of claim 6 wherein the first group comprises a first plurality of pixels immediately surrounding the underlying pixel.

Claim 8 (Original): The circuit of claim 6 wherein the second group comprises a second plurality of pixels immediately surrounding the first group.

Claim 9 (Original): The circuit of claim 6 wherein the first and second groups form a rectangular shape.

Claim 10 (Original): The circuit of claim 6 wherein the first and second groups form a diamond shape.

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Claim 11 (Original): The circuit of claim 6 wherein the first and second groups incorporate the Bayer pattern.

Claim 12 (Original): The circuit of claim 1 wherein the pixel value restoration circuit comprises a line-edge feature detection circuit for detecting whether a line or an edge feature passes through the underlying pixel.

Claim 13 (Original): The circuit of claim 1 wherein the pixel value restoration circuit comprises a spatially adaptive interpolation filter for deriving a the restoration value.

Claim 14 (Original): The circuit of claim 1 wherein the sensor is a CCD/CMOS sensor.

Claims 15-16 (Cancelled)

Claim 17 (Currently Amended): A method for processing pixel defects in a sensor, the method comprising:

measuring ~~the~~ a value of an underlying pixel;

determining whether the underlying pixel is defective;

deriving a restoration value from ~~the~~ values of neighboring pixels if the underlying pixel is defective; and

replacing the value of the underlying pixel with a the restoration value; wherein the step of determining comprises at least one of the following types of assessing:

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assessing whether the underlying pixel is stuck high;
assessing whether the underlying pixel is stuck low;
assessing whether the underlying pixel is abnormally sensitive; and
wherein the underlying pixel is processed serially such that a first type of
assessing is followed by a second type of assessing if the no defect is found during the
first type of assessing, and wherein the second type of assessing is followed by a third
type of assessing if the no defect is found during the second type of assessing.

Claims 18-19 (Cancelled)

Claim 20 (Previously Presented): The method of claim 17 wherein at least two of the
types of assessing are processed in parallel.

Claim 21 (Currently Amended): The method of claim 17 wherein the ~~step of~~
determining further comprises grouping the neighboring pixels into at least a first group and a
second group, the first group and the second group being processed separately;
wherein the ~~step of~~ assessing whether the underlying pixel is stuck high further
comprises:

comparing the value of the underlying pixel with a white threshold value; and
calculating a difference value if the value of the underlying pixel is greater than
the white threshold value, the difference value being derived from comparing the

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underlying pixel with the first group, wherein the underlying pixel is declared to be stuck high if the difference value is greater than the white threshold value;

wherein the ~~step of~~ assessing whether the underlying pixel is stuck low further comprises:

comparing the value of the underlying pixel with a dark threshold value; and

calculating a difference value if the value of the underlying pixel is less than the dark threshold value, the difference value being derived from comparing the underlying pixel with the first group, wherein the underlying pixel is declared to be stuck low if the difference value is greater than the dark threshold value;

wherein the ~~step of~~ assessing whether the underlying pixel is abnormally sensitive further comprises:

comparing the value of the underlying pixel ~~value~~ with a projected value, the projected value being derived from the second group, wherein the underlying pixel is declared to be an abnormal pixel if the value of the underlying pixel ~~value~~ varies from the projected value beyond a certain percentage.

Claim 22 (Original): The method of claim 21 wherein the first group comprises a first plurality of pixels that immediately surround the underlying pixel.

Claim 23 (Original): The method of claim 21 wherein the second group comprises a second plurality of pixels that immediately surround the first group.

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Claim 24 (Original): The method of claim 23 wherein the second group comprises the first group.

Claim 25 (Original): The method of claim 21 wherein the first group and the second group are the same.

Claim 26 (Original): The method of claim 17 further comprising detecting whether a line or an edge feature passes through the underlying pixel if determined to be defective.

Claim 27 (Currently Amended): The method of claim 26 wherein the ~~step of~~ detecting is achieved with a line-edge feature algorithm.

Claim 28 (Original): The method of claim 17 wherein the restoration value is derived from the values of the neighboring pixels using one-dimensional extrapolation.

Claim 29 (Original): The method of claim 17 wherein the restoration value is derived from the values of the neighboring pixels using two-dimensional extrapolation.

Claim 30 (Currently Amended): The method of claim 17 wherein the ~~step of~~ replacing is achieved with a spatially adaptive interpolation filter.

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Claim 31 (Currently Amended): The method of claim 17 wherein the ~~step of~~ replacing comprises applying a spatially adaptive interpolation along the direction of a line or edge feature if detected.